

# **AIR FORCE QUALIFICATION TRAINING PACKAGE (AFQTP)**



**FOR  
ELECTRICAL POWER PRODUCTION  
(3E0X2)**

**MODULE 21**

**ENGINE COOLING SYSTEM**

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Career Field Education and Training Plan (CFETP) references from 1 Aug 02 version.

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Supersedes AFQTP 3E0X2-19, 1 Oct 99

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Pages: 25/Distribution F

**Notice.** This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

**AIR FORCE QUALIFICATION TRAINING PACKAGES  
FOR  
ELECTRICAL POWER PRODUCTION  
(3E0X2)**

**INTRODUCTION**

***Before starting this AFQTP***, refer to and read the “[AFQTP Trainer/Trainee Guide](#).”

***AFQTPs are mandatory and must be completed*** to fulfill task knowledge requirements on core and diamond tasks for upgrade training. ***It is important for the trainer and trainee to understand*** that an AFQTP ***does not*** replace hands-on training, nor will completion of an AFQTP meet the requirement for core task certification. AFQTPs will be used in conjunction with applicable technical references and hands-on training.

***AFQTPs and Certification and Testing (CerTest) must be used as minimum upgrade requirements for Diamond tasks.***

**MANDATORY minimum upgrade requirements:**

***Core task:***

AFQTP completion  
Hands-on certification

***Diamond task:***

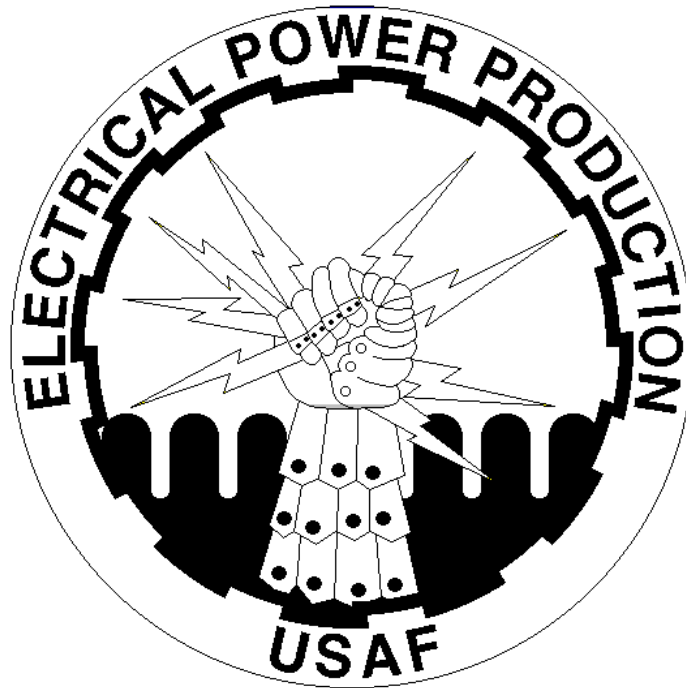
AFQTP completion  
CerTest completion (80% minimum to pass)

**Note:** *Trainees will receive hands-on certification training for Diamond Tasks when equipment becomes available either at home station or at a TDY location.*

***Put this package to use.*** Subject matter experts under the direction and guidance of HQ AFCESA/CEOF revised this AFQTP. If you have any recommendations for improving this document, please contact the Career Field Manager at the address below.

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## ENGINE COOLING SYSTEM

MODULE 21

AFQTP UNIT 2

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### TROUBLESHOOT (21.2.)

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## TROUBLESHOOT ENGINE COOLING SYSTEM

### *Task Training Guide*

<b>STS Reference Number/Title:</b>	21.2., Troubleshoot Engine Cooling System.
<b>Training References:</b>	<ol style="list-style-type: none"> <li>1. CD-ROM Air Force Qualification Training Package (AFQTP) 3E0X2 Electrical Power Production, Version 1.0, Sep 98: <i>Cooling Systems</i>.</li> <li>2. Career Development Course (CDC) 3E052B, Vol. 1, Unit 3-1: <i>Cooling Systems</i>.</li> <li>3. <a href="#">35C2 series Technical Orders (TOs), MEP Generators.</a></li> <li>4. Manufacturer's manuals.</li> <li>5. Local procedures.</li> </ol>
<b>Prerequisites:</b>	<ol style="list-style-type: none"> <li>1. <b>Possess as a minimum a 3E052 AFSC.</b></li> <li>2. <b>Review the following references:</b> <ol style="list-style-type: none"> <li>2.1. 35C2 series TOs and/or manufacturer's manuals.</li> <li>2.2. CD-ROM AFQTP 3E0X2 Electrical Power Production, Version 1.0, Sep 98: <i>Cooling Systems</i>.</li> <li>2.3. CDC 3E052B, Vol. 1, Unit 3-1.</li> </ol> </li> </ol>
<b>Equipment/Tools Required:</b>	<ol style="list-style-type: none"> <li>1. Computer to support AFQTP CD-ROM.</li> <li>2. General tool kit.</li> <li>3. Personal safety gear.</li> <li>4. Cooling system.</li> <li>5. Applicable manufacture's manual.</li> </ol>
<b>Learning Objective:</b>	How to troubleshoot cooling systems.
<b>Samples of Behavior:</b>	<ol style="list-style-type: none"> <li>1. Trainee will be able to troubleshoot cooling system for above-normal operating temperatures.</li> <li>2. Trainee will be able to troubleshoot cooling system for below normal operating temperatures.</li> </ol>
<b>Notes:</b>	
<ol style="list-style-type: none"> <li>1. To successfully complete this task, follow the steps outlined in the applicable TO or manufacturer manual exactly—no exceptions.</li> <li>2. Any safety violation is and automatic failure.</li> <li>3. Trainer must develop an exercise scenario to validate ability of trainee to meet learning objective and samples of behavior.</li> </ol>	

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## TROUBLESHOOT ENGINE COOLING SYSTEM

**1. Background:** While the engine is operating, you may encounter abnormal engine operating temperatures. Knowing system operation and functions of individual components is key to successful troubleshooting.

**1.1.** The purpose of the cooling system is to transfer the heat generated by the engine to some outside source. Coolant circulates throughout the engine to accomplish this task. The importance of proper cooling system maintenance cannot be over-stressed. The conventional cooling systems used on diesel engines are the open-type, closed-type, and air-cooled systems.

**1.1.1. Open type system:** The open type cooling system is used primarily in diesel installations. In this system, water travels through the water jackets in the block and then flows to an outside source, such as a cooling tower or spray pond, where it is then cooled by the air and returned to the engines cooling system.

**1.1.2. Closed type system:** In the closed type system, the diesel engine has coolant (water) jackets or passages in the engines block to permit coolant to pass over hot combustion chamber surfaces. This coolant, which is circulated by a water pump, serves as a liquid conveyor to carry excess heat from the combustion chamber surfaces to the radiator. The outside air flowing through the radiator removes this heat.

**1.1.3. Air-cooled system:** Air cooled systems are designed to quickly transfer heat from the combustion chamber to the outside of the engine. Engines with an air-cooled system are equipped with cooling fins. These fins are needed to maintain the correct temperature and air velocity around the cylinder(s).

**1.2.** Since troubleshooting is a step-by-step procedure, the effectiveness depends on how much you know about the equipment and how much you think while working. The ability to troubleshoot depends on your capability to think and apply knowledge. To troubleshoot effectively, you must follow a systematic procedure. First, study the symptoms of the trouble thoroughly and ask yourself these questions:

**1.2.1.** What were the warning signs preceding the trouble?

**1.2.2.** What recent repair has been done?

**1.2.3.** Has a similar trouble occurred before?

**1.3.** Next, follow the basic troubleshooting process:

**1.3.1.** Perform an operational check.

**1.3.2.** Analyze the malfunction.

**1.3.3.** Locate the malfunction.

**1.3.4.** Perform corrective action.

**1.3.5.** Perform an operational check.

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**NOTE TO TRAINER:**

Trainer/Certifier must provide equipment and scenario for troubleshooting cooling systems in order to complete task. Use troubleshooting chart on the next page for guidelines if needed.

**2. To perform troubleshooting of cooling system, follow these steps:**

**Step 1: Trainee is provided equipment and cooling problem scenario in which to perform task.**

**Step 2: Use five-step process in troubleshooting:**

- 2.1.** Perform an operational check.
- 2.2.** Analyze the malfunction.
- 2.3.** Locate the malfunction.
- 2.4.** Perform corrective action.
- 2.5.** Perform an operational check.

**Step 3: Document maintenance on AF Form 719.**

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<b>COOLING SYSTEM TROUBLESHOOTING CHART</b>	
<b><i>COOLING SYSTEM (ABOVE NORMAL HEATING)</i></b>	
<b>CAUSE</b>	<b>REMEDY</b>
Low coolant level.	Fill to capacity. Check for leaks and repair as needed.
Bad temperature gauge.	Check with known good gauge. Repair or replace gauge.
Clogged radiator.	Clean and flush radiator core.
Loose fan or water pump belts.	Tighten to specifications.
Bad Hoses.	Check for leaks and collapsed hoses. Change hoses as needed.
Bad temperature regulator.	Test thermostats and replace as needed.
Bad water pump.	Check for loose water pump pulley or impeller. Remove pump and check for impeller damage and proper impeller clearance.
Shutter not opening.	Check operating temperature of shutters. Shutter must be closed below the water temperature regulators fully opening rating.
<b><i>LOSS OF COOLANT (OUTSIDE LEAKS)</i></b>	
<b>CAUSE</b>	<b>REMEDY</b>
Leaks in hoses or connections.	Inspect hoses, clamps, and connections and repair as needed.
Leaks in radiator or expansion tank	Pressure test radiator and tank to check for leaks.
Leaks in water pump.	Check for leaks from pump with the engine off and engine running. Install new pump as needed.
Cylinder head gasket leak.	Inspect for leaks along the surface of the cylinder head gasket. Install new gasket as needed.
<b><i>LOSS OF COOLANT (INSIDE LINDER LEAKAGE)</i></b>	
<b>CAUSE</b>	<b>REMEDY</b>
Cylinder head gasket leakage.	Repair as needed.
Cracks in cylinder head.	Repair or replace as needed.
Cracks in cylinder block.	Repair or replace as needed.

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**REVIEW QUESTIONS  
FOR  
TROUBLESHOOT ENGINE COOLING SYSTEM**

<b>QUESTION</b>	<b>ANSWER</b>
1. The primary purpose of a cooling system is to transfer heat.	a. True. b. False.
2. The closed type system uses a cooling tower or spray pond.	a. True. b. False.
3. The most important key in troubleshooting is knowing how the system operates.	a. True. b. False.

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## TROUBLESHOOT ENGINE COOLING SYSTEM

### PERFORMANCE CHECKLIST

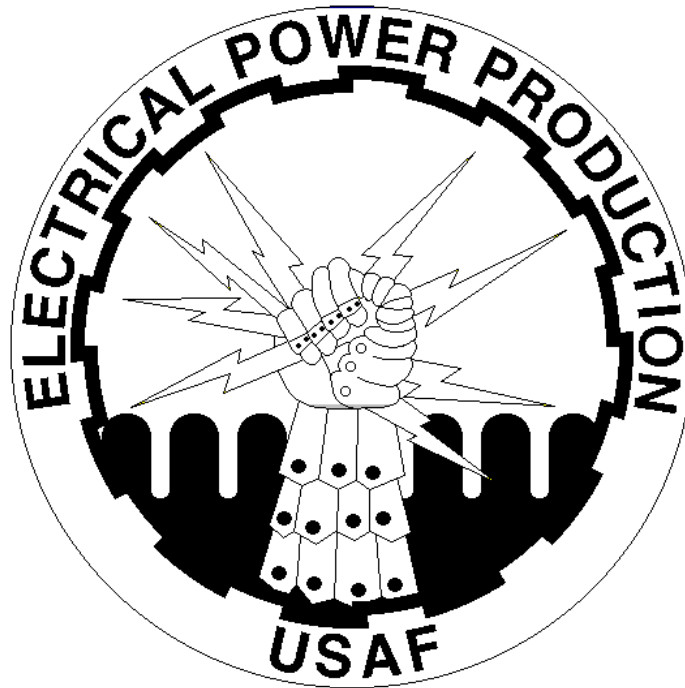
#### INSTRUCTIONS:

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

DID THE TRAINEE....?	YES	NO
1. Have equipment and scenario available to perform task		
2. Perform an operational check		
3. Analyze the malfunction		
4. Locate the malfunction		
5. Perform corrective action		
6. Perform an operational check		
7. Document maintenance on AF Form 719		
8. Comply with all safety requirements		

**FEEDBACK:** Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

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## REPLACE COMPONENTS

MODULE 21

AFQTP UNIT 4

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### DRIVE BELTS (21.4.5.)

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## REPLACE DRIVE BELTS

### *Task Training Guide*

<b>STS Reference Number/Title:</b>	21.4.5., Replace Drive Belts .
<b>Training References:</b>	<ol style="list-style-type: none"> <li>1. <a href="#">32,33,34, and 35C2 Series Technical Orders (TOs).</a></li> <li>2. Manufacturer's manuals.</li> <li>3. <a href="#">Air Force Occupational Safety and Health Standard (AFOSHSTD) 91-45, Hazardous Energy Control and Mishap Prevention Signs and Tags.</a></li> <li>4. <a href="#">Air Force Instruction (AFI) 32-1062, Electrical Power Plants and Generators.</a></li> </ol>
<b>Prerequisites:</b>	<ol style="list-style-type: none"> <li>1. <b>Possess as a minimum a 3E032 AFSC.</b></li> <li>2. <b>Review the following references:</b> <ol style="list-style-type: none"> <li>2.1. AFOSHSTD 91-45 for lockout/tag out procedures.</li> <li>2.2. Applicable TOs or manufacturer's manuals.</li> <li>2.3. AFI 32-1062.</li> </ol> </li> </ol>
<b>Equipment/Tools Required:</b>	<ol style="list-style-type: none"> <li>1. General tool kit.</li> <li>2. Personal safety equipment.</li> <li>3. MEP-007B.</li> <li>4. Drive belts.</li> </ol>
<b>Learning Objective:</b>	Replace drive belts on a cooling system.
<b>Samples of Behavior:</b>	Trainee will be able to remove and/or replace cooling drive belts.
<b>Notes:</b>	
<ol style="list-style-type: none"> <li>1. To successfully complete this element, follow the steps outlined in the applicable technical manual exactly—no exceptions.</li> <li>2. Prior to performing any maintenance, technician <b>MUST</b> isolate the starting system, and apply lockout and tag-out procedures.</li> <li>3. Any safety violation is an automatic failure.</li> </ol>	

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## REPLACE DRIVE BELTS

**1. Background:** During generator operation, drive belts are primarily responsible for maintaining proper engine temperature by operating the radiator fan. Drive belts are directly connected to the engine crankshaft pulley and failure will eventually cause the generator to overheat and shutdown. Proper belt inspection will prolong belt life and/or prevent equipment failure by allowing the inspector to adjust a belt, which is too loose, too tight or defective. It is the purpose of this AFQTP to explain the procedure in replacing worn/damage cooling drive belts.

**1.1.** Engine drive belts should be inspected before and after each operation. Inspect for fraying, cracks, proper tension or other signs of deterioration. Apply a 25-pound (approximately) force midway between the driver and drive pulley. Belt deflection should be between 9/16 and 3/16 inch

**NOTE:**

This AFQTP has been developed using the MEP-007B as a model. Equipment may vary slightly, but the procedures are basically the same for replacing all belts.

**SAFETY:**

**PRIOR TO INSPECTING OR REPLACING ANY BELT YOU MUST MAKE SURE THE UNIT WILL NOT START AUTOMATICALLY. YOU MUST ALSO DE-ENERGIZE THE DC CIRCUIT BREAKER AND PLACE THE BATTLE SHORT SWITCH IN THE RAISED POSITION. THESE ACTIONS ARE REQUIRED TO KEEP THE ENGINE FROM STARTING DURING BELT REPLACEMENT.**

## **2. To perform this task, follow these steps:**

**NOTE:**

Fan belts are a matched set and shall be replaced as a set even if only one requires replacing. Fan belts should be positioned in two rear pulley grooves and alternator belt in groove forward of the fan belts.

**Step 1. Isolate the engine from starting using lockout/tag out procedures.**

**1.1.** Refer to AFOSHSTD 91-45.

**Step 2: De-energize DC circuit breaker and place 'Battle Short Switch' in the raised position.**

**Step 3: Disconnect batteries, IAW. [TO 35C2-3-442-11](#), para. 4-29.b.2. Disconnect negative cable first.**

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**Step 4: Remove alternator belt as stated below.**

- 4.1. Remove the alternator fan guard (Figure 1)
- 4.2. Loosen alternator bolt allowing the alternator to pivot during removal.
- 4.3. Rotate the adjusting nut (located under alternator) until alternator belt is sufficiently loose for removal.
- 4.4. Remove belt.

**Step 5: Loosen fan bracket bolts and fan guards (Figure 1).**

**Step 6: Rotate fan bracket adjusting bolt and lower the fan bracket until it bottoms and remove adjusting bolt.**

**Step 7: Open battery compartment access door, remove two quick release pins, and pull out batteries using the roll out tray.**

**NOTE:**

Pulling out the batteries using the roll out tray will give you the extra clearance you will need to do the job comfortably and will prevent damage that might occur if the fan were to be dropped during removal. If, for example, the fan dropped onto the batteries, one of the blades could make contact with a positive post and another blade could make contact with the engine block shorting out the battery.

**Step 8: Support the weight of the fan assembly and remove fan bracket bolts, washers, and lock washers.**

**SAFETY:**

**EXERCISE CARE TO PREVENT DAMAGING THE RADIATOR WITH THE FAN DURING REMOVAL OF THE FAN.**

**Step 9: Move fan bracket away from engine until it can be rotated.**

**Step 10: Rotate bracket 180 degrees so that the short end is even with top of fan pulley.**

**Step 11: Remove belts.**

**Step 12: Clean pulleys with non-corrosive cleaner and dry thoroughly.**

**Step 13: Inspect pulleys and fan mounting bracket for breaks, and other damage.**

**Step 14: Install new belts bracket bolts, washers, and lock washers.**

**Step 15: Rotate fan bracket to normal mounting position and secure bracket to engine with fan.**

**Step 16: Install fan bracket adjusting bolt.**

**Step 17: Tighten fan bracket adjusting bolt until fan belts are at proper tension (1/2 to 3/4 inches for new belts).**

**Step 18: With fan belts at proper tension, tighten fan bracket bolts (4 ea.)**

**Step 19: Tighten lower adjusting rod nut until alternator belt tension is between 9/16 to 13/16 inches with a 25 lb. force applied midway between the driver (crankshaft) pulley and the driven (alternator) pulley.**

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**Step 20: Reinstall alternator belt.**

**20.1.** Alternator belt should be in first pulley groove forward of the fan belts.

**20.2.** Rotate the adjusting nut (located under alternator) until alternator belt deflects 9/16 to 13/16 of an inch while applying approximately 25lbs. of force halfway between the crankshaft pulley and the alternator pulley.

**20.3.** After desired adjustment has been obtained, retighten the alternator bolt.

**20.4.** Reinstall the alternator fan guard.

**Step 21: Reinstall fan guards.**

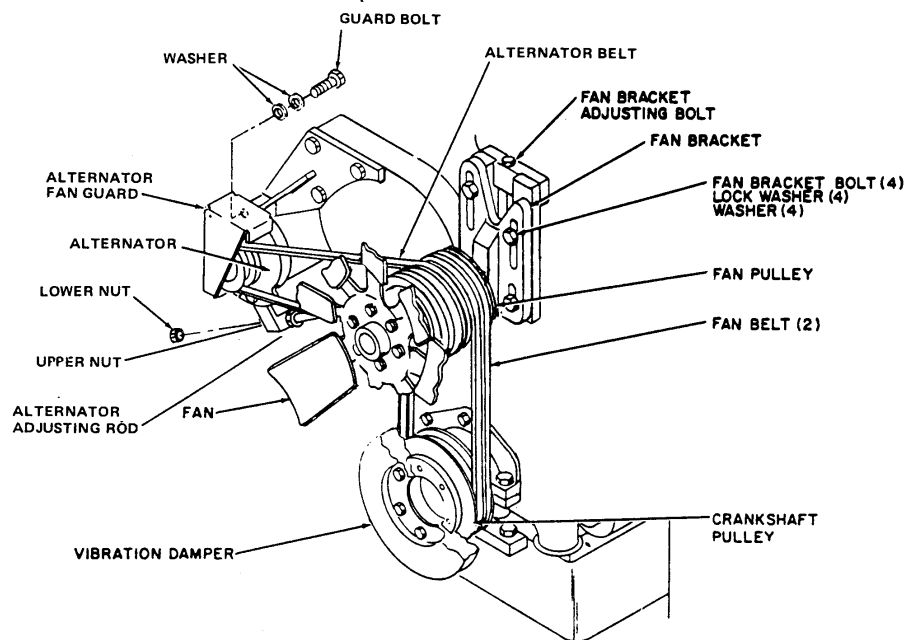
**Step 22: Don't forget to reconnect the batteries. Connecting the negative battery cable last.**

**Step 23: Perform functional check.**

**NOTE:**

Before performing a functional check, insure that fan and/or alternator belts do not make contact with the fan guard or alternator guards.

**Step 24: Document maintenance on AF Form 719.**



**Figure 1, Typical Belt Diagram.**

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**REVIEW QUESTIONS  
FOR  
REPLACE DRIVE BELTS**

QUESTION	ANSWER
1. What should be de-energized prior to belt replacement?	a. Commercial power. b. Batteries. c. Dc circuit breaker. d. None of the above.
2. What position should the Battle Short switch be placed in prior to belt removal?	a. Off. b. Remote. c. Local. d. Raised.
3. How much force should be applied to the belt to check tension (approximate)?	a. 25 lb. b. 30 lb. c. 45 lb. d. 50 lb.
4. What should you check for after the belt replacement?	a. Unusual noise. b. Vibration. c. Belt contact with guards. d. All of the above.
5. Which pulley is the driving pulley?	a. Alternator pulley noise. b. Fan pulley. c. Crankshaft pulley. d. Camshaft pulley.
6. How should matched belts be replaced?	a. Annually. b. Only the damaged one. c. As a set. d. As they fail.
7. What adjusts the alternator belt?	a. Lower adjusting nut. b. Fan bracket adjusting bolt. c. 25 lb. force. d. Both b and c.
8. What adjusts the fan belts?	a. Lower adjusting rod bolt. b. Alternator adjuster. c. Fan bracket adjusting bolt. d. Pry bar.

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## TROUBLESHOOT ENGINE COOLING SYSTEM

### PERFORMANCE CHECKLIST

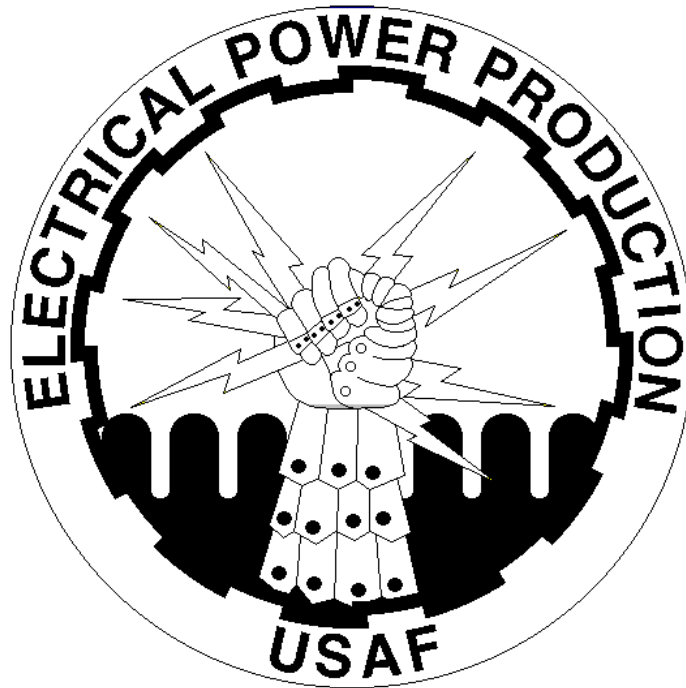
#### INSTRUCTIONS:

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

DID THE TRAINEE....?	YES	NO
1. Isolate the engine from starting using lockout/tag out procedures		
2. De-energize circuit breaker		
3. Place battle short in raised position		
4. Disconnect the batteries		
5. Pull out battery tray		
6. Remove fan guard		
7. Remove alternator belt		
8. Loosen fan bracket bolts		
9. Remove fan belts		
10. Clean and dry pulleys		
11. Inspect pulleys and fan bracket for damage and cracks		
12. Replace fan belts as a set		
13. Install belts on correct pulley grooves		
14. Adjust fan belts correctly		
15. Adjust alternator belt correctly		
16. Replace alternator guard		
17. Re-install fan guards		
18. Reconnect the batteries		
19. Perform functional check		
20. Document maintenance action on AF Form 719		
21. Comply with all safety requirements		

**FEEDBACK:** Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

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## COOLING SYSTEM

MODULE 21

AFQTP UNIT 5

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SERVICE (21.5.)

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## SERVICE ENGINE COOLING SYSTEM

### *Task Training Guide*

<b>STS Reference Number/Title:</b>	21.5., Service Engine Cooling System.
<b>Training References:</b>	<ol style="list-style-type: none"> <li>1. CD-ROM AFQTP 3E0X2 Electrical Power Production, Version 1.0, Sep 98: <i>Cooling Systems</i>.</li> <li>2. Career Development Course (CDC) 3E052B, Vol. 1, Unit 3-1: <i>Cooling Systems</i>.</li> <li>3. <a href="#">35C2 series Technical Orders (TOs), MEP Generators.</a></li> <li>4. <a href="#">AFOSHSTD 91-45, Hazardous Energy Control and Mishap Prevention Signs and Tags.</a></li> <li>5. <a href="#">Military Specification MIL-C-10597.</a></li> <li>6. Manufacturer's Manuals.</li> <li>7. Local Procedures.</li> </ol>
<b>Prerequisites:</b>	<ol style="list-style-type: none"> <li>1. <b>Possess as a minimum a 3E032 AFSC.</b></li> <li>2. <b>Review the following references:</b> <ol style="list-style-type: none"> <li>2.1. CDC 3E052B, Vol. 1, Unit 3-1.</li> <li>2.2. AFOSHSTD 91-45 for lockout/tag out procedures.</li> <li>2.3. Applicable TO or manufacturer's manual.</li> </ol> </li> <li>3. <b>Complete the CD-ROM AFQTP 3E0X2 Electrical Power Production, Version 1.0, Sep 98: <i>Cooling Systems</i>.</b></li> </ol>
<b>Equipment/Tools Required:</b>	<ol style="list-style-type: none"> <li>1. Computer to support AFQTP CD-ROM.</li> <li>2. General tool kit.</li> <li>3. Applicable TO or manufacturer's manual.</li> <li>4. Personal safety equipment.</li> <li>5. Hydrometer.</li> <li>6. Suitable container.</li> <li>7. MEP-007.</li> </ol>
<b>Learning Objective:</b>	Identify when and how specific maintenance procedures are performed on cooling systems for mobile diesel generators.
<b>Samples of Behavior:</b>	The trainee will be able to service cooling system by: draining, cleaning, flushing, and safely adding corrosion inhibitor to the cooling system.
<b>Notes:</b>	
<ol style="list-style-type: none"> <li>1. To successfully complete this element, follow the steps outlined in the applicable technical order or manufacturer manual exactly—no exceptions.</li> <li>2. Any safety violation is an automatic failure.</li> <li>3. Prior to performing any maintenance, technician <b><u>MUST</u></b> isolate the starting system, and apply lockout and tag-out procedures.</li> </ol>	

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## SERVICE ENGINE COOLING SYSTEM

**1. Background:** Cooling system maintenance is very important in order to provide reliable power. The most important consideration in cooling system maintenance is keeping it clean. This involves the proper maintenance of filters, and the draining of the system at regular intervals. To avoid unscheduled downtime, reduced engine durability and possible mechanical failure, you as a technician should be familiar with system operation and key components in the cooling system.

**1.1. Coolant:** Coolant is the liquid medium that circulates through the cooling system to absorb excess heat. Plain water can cause rust and corrosion in the cooling system. Hard water leaves scale deposits on the cylinder liner and water jacket surface that can interfere with heat transfer. Most diesel manufactures recommend a coolant mixture of an ethylene base antifreeze, clean water, and a corrosion inhibitor.

**1.2. Hoses:** Hoses carry the coolant between the different system components.

**1.3. Radiator:** The radiator has two main purposes in the cooling system:

**1.3.1.** It allows the coolant's heat to be released into the atmosphere, while keeping the coolant under pressure

**1.3.2.** It provides enough liquid storage to ensure that the cooling system works properly.

**1.4. Thermostat:** The temperature in a diesel engine cooling system is controlled by a thermostat that is located between the cylinder head and the radiator top tank. At coolant temperatures below 170 degrees, most thermostat valves remain closed. All of the coolant is circulated through the engine and is directed back to the suction side of the water pump. When the coolant thermostat reaches approximately 185 degrees, the valve opens, allowing coolant to pass through the radiator to be cooled and reused.

**1.5. Water pump:** The water pump is the heart of the cooling system. It circulates coolant through the engine block, the cylinder heads, and the radiator or heat exchanger, and the oil cooler.

**1.6.** We have listed only a few of the key components to give an overview of the system. Be sure to follow TO or manufacturer procedures when servicing coolant systems at your location.

**2. Complete the CD-ROM AFQTP 3E0X2 Electrical Power Production, Version 1.0, Sep 98: Cooling System. Upon completion of the above-mentioned CD-ROM properly service cooling system using the step-by-step procedures listed below.**

**NOTE:**

The review questions for this material are contained in the above-mentioned CD-ROM.

**Notice.** This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

**NOTE TO TRAINER:**

The step has been developed using the MEP-007 as a model. Equipment may vary slightly, but the procedures are basically the same for servicing cooling systems.

**3. To perform this task, follow these steps:**

**Step 1: Isolate the engine from starting using lockout/tag out procedures.**

1.1. Refer to AFOSHSTD 91-45.

**Step 2: Service the cooling system.**

2.1. Refer to applicable TO or manufacturer manual.

**Step 3: Re-configure engine for operation.**

**Step 4: Perform a functional test at operating temperature.**

**Step 5: Retest the coolant to ensure proper specific gravity.**

**Step 6: Document maintenance on AF Form 719.**

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## SERVICE ENGINE COOLING SYSTEM

### PERFORMANCE CHECKLIST

#### INSTRUCTIONS:

The trainee must satisfactorily perform all parts of the task without assistance. Evaluate the trainee's performance using this checklist.

DID THE TRAINEE....?	YES	NO
1. Isolate the engine from starting using lockout/tag out procedures		
2. Service the cooling system according to applicable TO or manufacturer manual		
3. Re-configure engine for operation		
4. Perform a functional test at operating temperature		
5. Retest the coolant to ensure proper specific gravity		
6. Document maintenance action on AF Form 719		
7. Comply with all safety requirements		

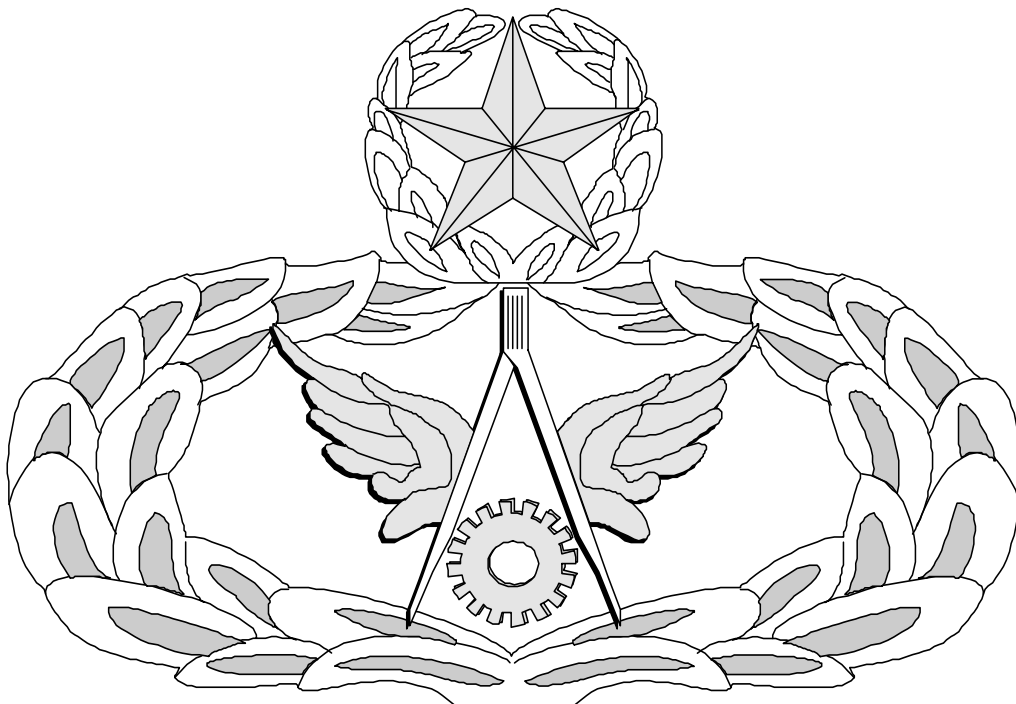
**FEEDBACK:** Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

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# Air Force Civil Engineer

## QUALIFICATION TRAINING PACKAGE (QTP)

### REVIEW ANSWER KEY



FOR  
ELECTRICAL POWER PRODUCTION  
(3E0X2)

MODULE 21  
ENGINE COOLING SYSTEM

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**Key 1**

**TROUBLESHOOT ENGINE COOLING SYSTEM  
(3E0X2-21.2.)**

QUESTION	ANSWER
1. The primary purpose of a cooling system is to transfer heat.	a. True.
2. The closed type system uses a cooling tower or spray pond.	b. False.
3. The most important key in troubleshooting	

**REPLACE DRIVE BELTS  
(3E0X2-21.4.5.)**

QUESTION	ANSWER
1. What should be de-energized prior to belt inspection?	c. DC circuit breaker.
2. What position should the Battle Short switch be placed in prior to belt replacement?	d. Raised.
3. How much force should be applied to the belt to check tension (approximate)?	a. 25 lb.
4. What should you check for after the belt replacement?	d. All of the above.
5. Which pulley is the driving pulley?	c. Crankshaft pulley.
6. How should belts be replaced?	c. As a set.
7. What adjusts the alternator belt?	a. Lower adjusting rod bolt.
8. What adjusts the fan belts?	c. Fan bracket adjusting bolt.

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MEMORANDUM FOR HQ AFCESA/CEOF  
139 Barnes Drive Suite 1  
Tyndall AFB, FL 32403-5319

FROM:

SUBJECT: Qualification Training Package Improvement

1. Identify module.

Module # and title \_\_\_\_\_

2. Identify improvement/correction section(s):

_____ STS Task Reference	_____ Performance Checklist
_____ Training Reference	_____ Feedback
_____ Evaluation Instructions	_____ Format
_____ Performance Resources	_____ Other
_____ Steps in Task Performance	

3. Recommended changes--use a continuation sheet if necessary.

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4. You may choose to call in your recommendations to DSN 523-6392 or FAX DSN/Commercial 523-6488 or (850) 283-6488 or email [ceof.helpdesk@tyndall.af.mil](mailto:ceof.helpdesk@tyndall.af.mil).

5. Thank you for your time and interest.

YOUR NAME, RANK, USAF  
Title/Position